



How Well Do Aggregate Banking Ratios Identify Systemic Problems?

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Introduction and Motivation

Banking sector stability has received attention in policy discussions in the past decade. Key to safeguarding stability is the early identification of the build up of banking vulnerabilities.

The need for tools to assess the strengths and weaknesses of financial systems led to efforts to define financial soundness indicators (FSIs) that are designed to monitor the health of financial institutions, markets, and their household and corporate counterparts.

The IMF coordinates efforts of national authorities to compile and disseminate internationally comparable FSIs (Sundararajan et al., 2002).



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Introduction and Motivation (cont'd)

“Benchmarking of FSIs”

- a) How to interpret values of key FSIs?
- b) Can we find thresholds that signal whether a system is headed for a crisis?

FSIs might complement the toolkit for country surveillance work, but thus far limited use of this type of data in the early-warning system literature due to data availability and methodological considerations.

Three questions we seek to answer in the paper

- a) Can FSIs serve as early warning indicators of problems?
- b) If not, can they be used for “real-time” monitoring?
- c) If not, can they at least be used for ex-post explanations?



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Macroprudential analysis and FSIs

The interest in understanding banking crises led to the creation of a new body of analysis, termed macroprudential analysis, with the aim to limit episodes of financial distress leading to significant macroeconomic losses.

The key subgroup of the macroprudential indicators are FSIs, which include both aggregated information on financial institutions and indicators describing markets in which financial institutions operate.

Core set and encouraged set of FSIs

Core and encouraged set identified based on meetings of experts, surveys of authorities, reviews of literature. Take into account feasibility of compilation.



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Literature on the identification of systemic banking crises

Empirical studies on the determinants of systemic banking crises commonly utilize macroeconomic and institutional variables (e. g. Demirgüç-Kunt and Detragiache, 1998, 2000, 2005; Hutchinson, 2002).

Banking crises are modeled as binary outcomes but use of bank data as explanatory variables is limited (ECB, 2005 being the notable exception).

No agreement in the literature on specification of models.

Classification of crisis episodes

- (1) Caprio and Klingebiel (2003): 117 systemic banking crises in 95 countries and 51 borderline systemic problems in 45 economies since the 1970s
- (2) Demirgüç-Kunt and Detragiache (2005): 77 crises in 94 countries in 1980-2002.



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Data and Methodology

The dataset includes information for 100 countries from 1994 to 2004.

We focus on selected set of core FSIs due to data availability.

Data on FSIs collected during IMF missions.

Macroeconomic variables obtained from IFS, and WDI.

Definition of Systemic Crises

Demirgüç-Kunt and Detragiache (2005)

- a) Nonperforming assets to total assets >10 percent.
- b) The cost of the rescue operation > 2 percent of GDP.
- c) Banking problems led to a large-scale nationalization of banks.
- d) Extensive bank runs or emergency measures (e.g., deposit freezes, prolonged bank holidays, or generalized deposit guarantees).

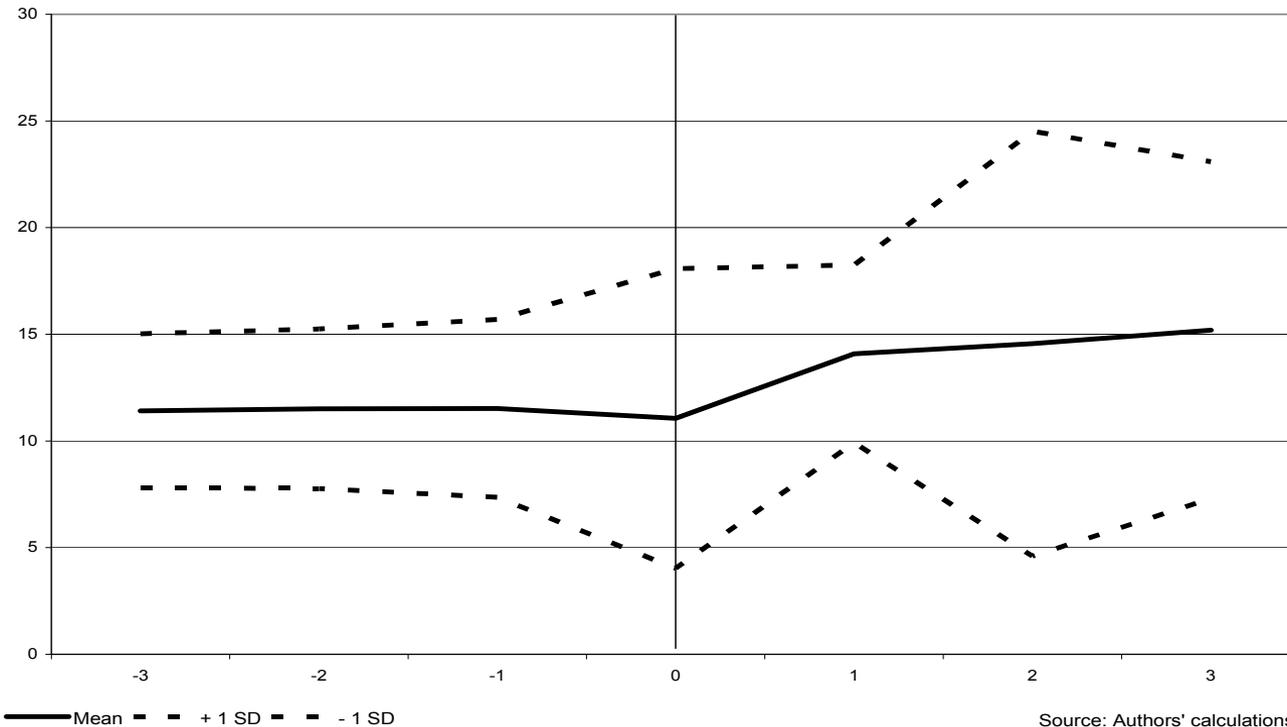
Caprio and Klingebiel (2003)

- a) Systemic crises are episodes during which much or all bank capital is exhausted.
- b) Nonsystemic banking crises are episodes of problems of smaller magnitude.



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Behavior of FSIs in Crisis Countries: Regulatory Capital to RWA

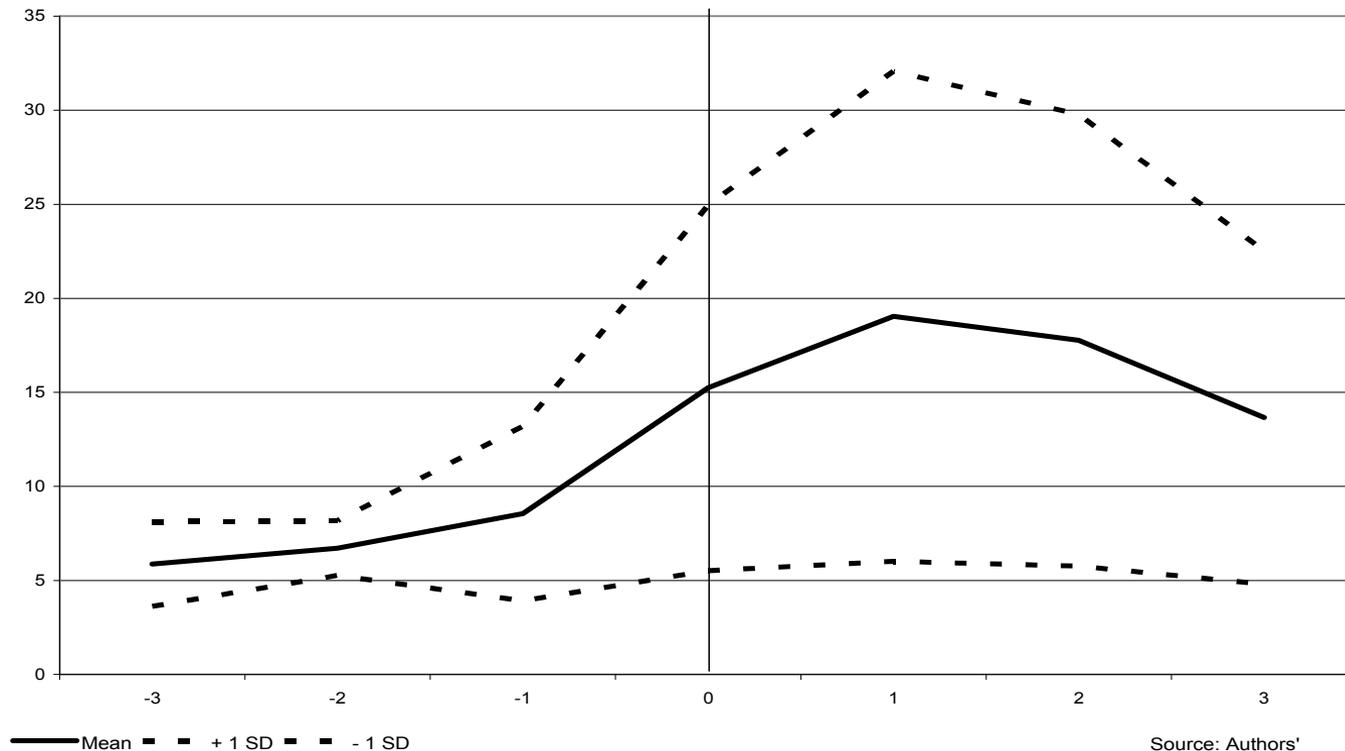


The graph plots the behavior of the FSI around an event window of +/- 3 years around a crisis whereby t_0 denotes the classification as banking crisis. Regulatory capital itself does not send a signal for the occurrence of a banking crisis.



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Behavior of FSIs in Crisis Countries: NPLs to Total Loans

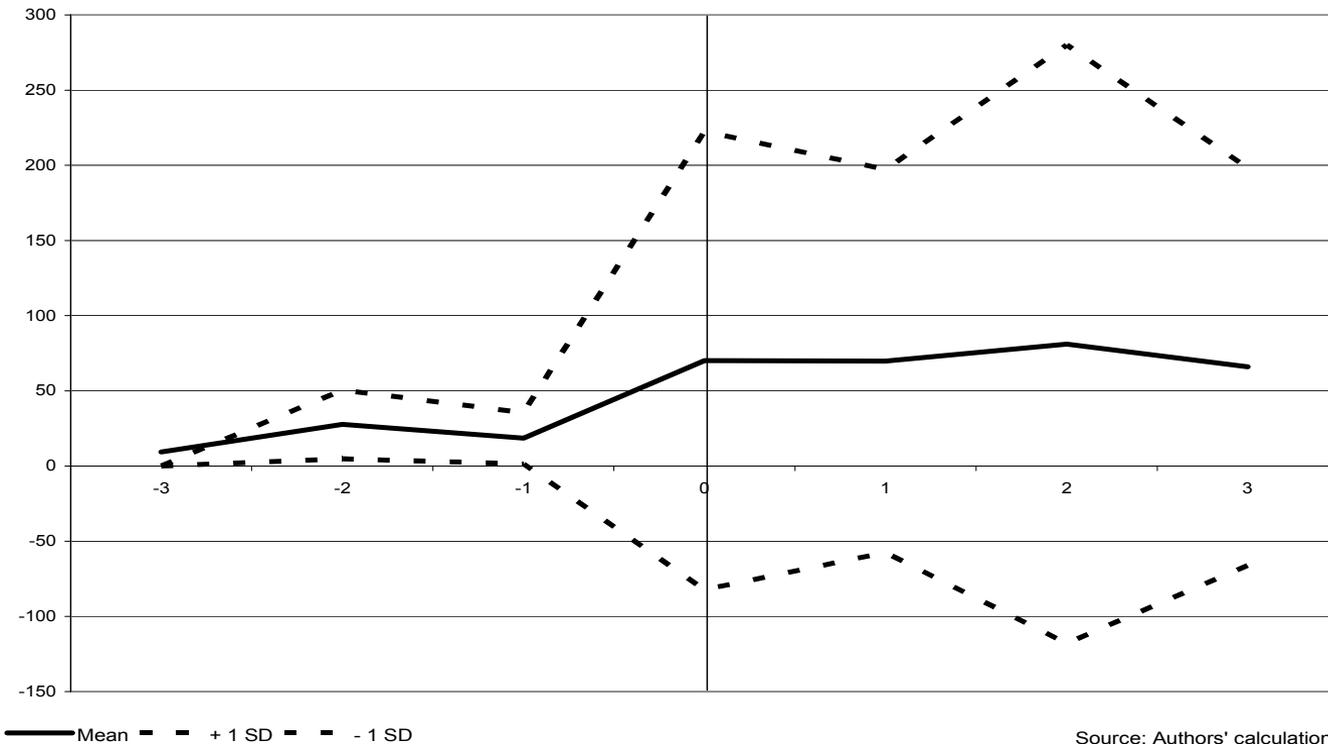


Nonperforming loans behave intuitively. The rise prior to a crisis suggests deteriorating asset quality. When the crisis unfolds, NPLs are fully recognize, however, this happens with a time lag.



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Behavior of FSIs in Crisis Countries: NPLs to Capital

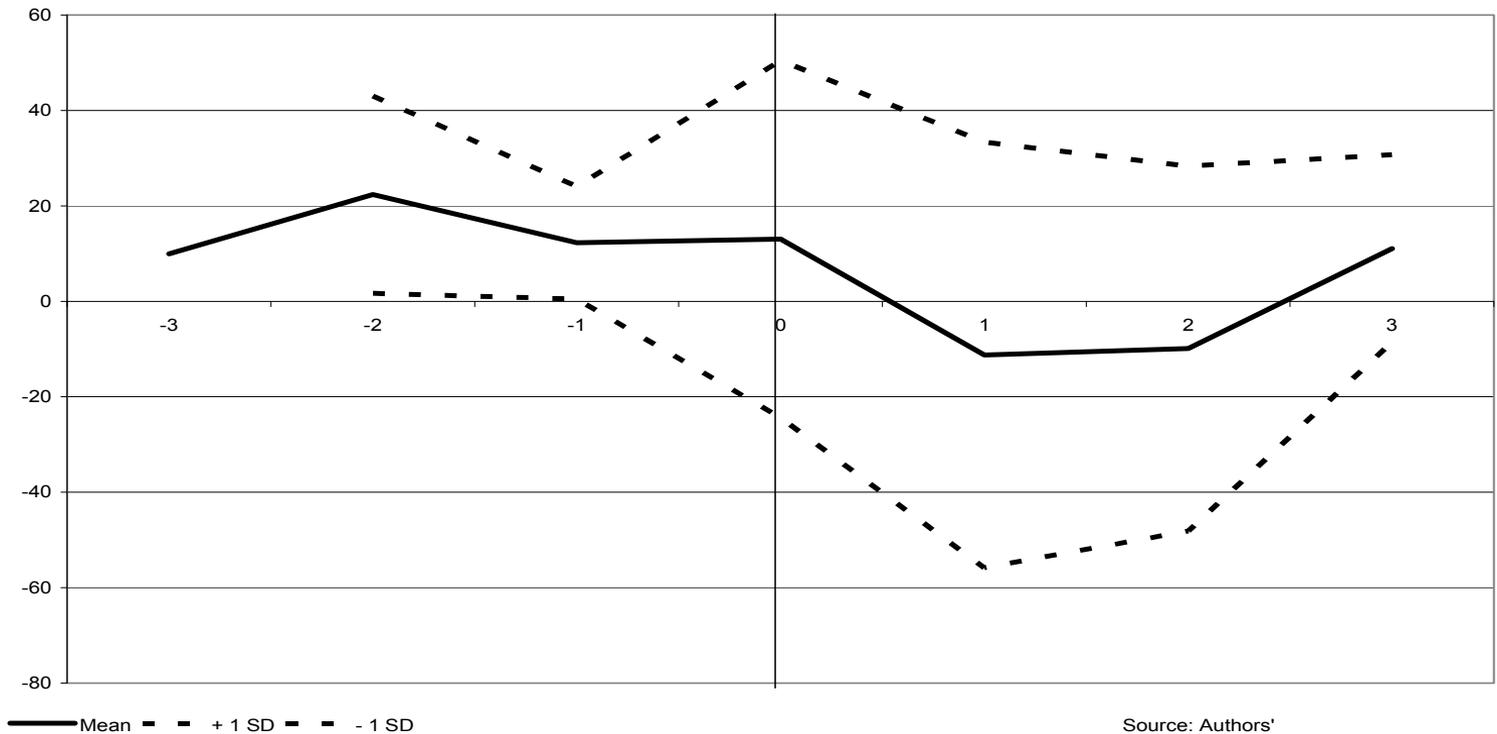


Nonperforming loans net of provisions to capital increase in the run-up to the crisis, banks recognize the deterioration in asset quality.



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Behavior of FSIs in Crisis Countries: ROE

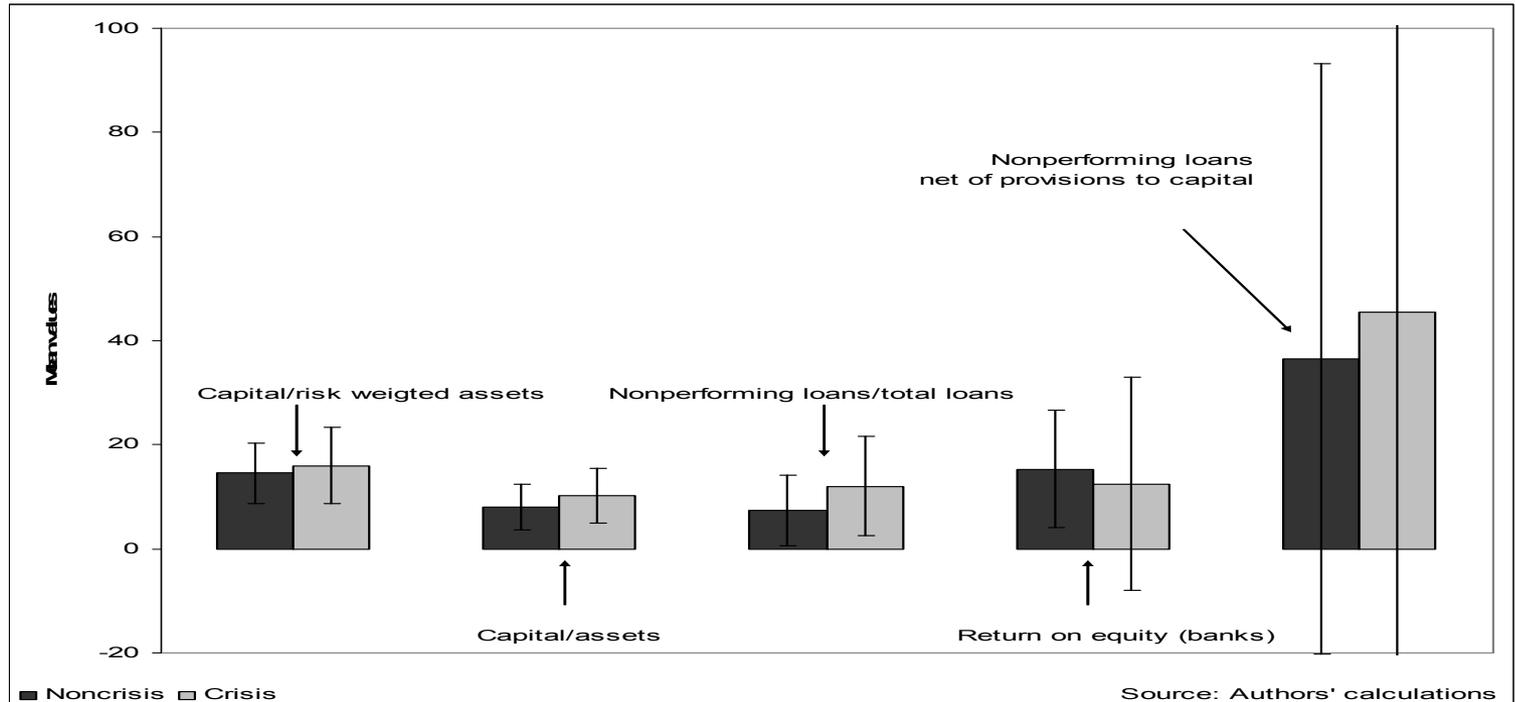


Profitability declines after a crisis. The lack of deterioration of profitability in the run-up to the crisis may be due to “gambling for resurrection”.



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Behavior of FSIs in Crisis Countries: Summary



Visual inspection of the behavior of the banking ratios around the event date indicates that some key ratios are candidates for the identification of banking problems. In particular, deteriorating asset quality is a good indicator for deterioration in banking sector soundness.



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Logit Model for Crisis regressions (marginal effects).

Independent variable	1	2	3	4	5	6	7	8
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Capital/risk weighted assets	-	-0.0004 (0.0003)	-0.0005* (0.0003)	-0.0004 (0.0003)	-0.0005* (0.0003)			
Nonperforming loans/total loans	+	0.0005* (0.0003)	0.0005* (0.0003)	0.0005 (0.0003)	0.0005 (0.0003)			
Return on equity (banks)	-	-0.0007*** (0.0002)	-0.0007*** (0.0003)	-0.0007*** (0.0002)	-0.0007*** (0.0003)			
Return on equity (corporates)	-		0.0004 (0.0003)		0.0004 (0.0003)			
Debt/equity (corporates)	+		0.0001*** (0.0000)		0.0001*** (0.0000)			
Capital/risk weighted assets _{t-1}	-				-2.02E-05 (0.0003)	-0.0001 (0.0003)	-2.71E-05 (0.0003)	-0.0001 (0.0003)
Nonperforming loans/total loans _{t-1}	+				0.0003 (0.0003)	0.0003 (0.0003)	0.0003 (0.0003)	0.0004 (0.0003)
Return on equity (banks) _{t-1}	-				-0.0007*** (0.0002)	-0.0007*** (0.0002)	-0.0007*** (0.0002)	-0.0007*** (0.00020)
Return on equity (corporates) _{t-1}	-					0.0002 (0.0003)		0.0002 (0.0003)
Debt/equity (corporates) _{t-1}	+					0.0001*** (0.0000)		0.0001*** (0.0000)

Both contemporaneous and the lagged ratio of capital to RWA show consistently the anticipated sign, the same applies to the measure of asset quality. We also find that deteriorating profits are a very good and significant precursor for systemic banking problems. The same applies to corporate leverage.



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Duration Model for the Timing of Crises (parametric).

Independent Variable	1	2	3	4
Controls	✓	✓	✓	✓
Capital/risk weighted assets	0.0005 (0.0007)	0.0005 (0.0008)	0.0006 (0.0007)	0.0005 (0.0008)
Nonperforming loans/total loans	-0.0005 (0.0007)	-0.0004 (0.0007)	-0.0005 (0.0007)	-0.0004 (0.0007)
Return on equity (banks)	0.0023*** (0.0008)	0.0023*** (0.0008)	0.0023*** (0.0008)	0.0023*** (0.0008)
Return on equity (corporates)		-0.0004 (0.0005)		-0.0004 (0.0006)
Debt/equity (corporates)		8.13E-06 (0.0001)		0.0000 (0.0001)

The duration models reiterate the findings from the logit model that bank return on equity is a strong indicator for systemic soundness.



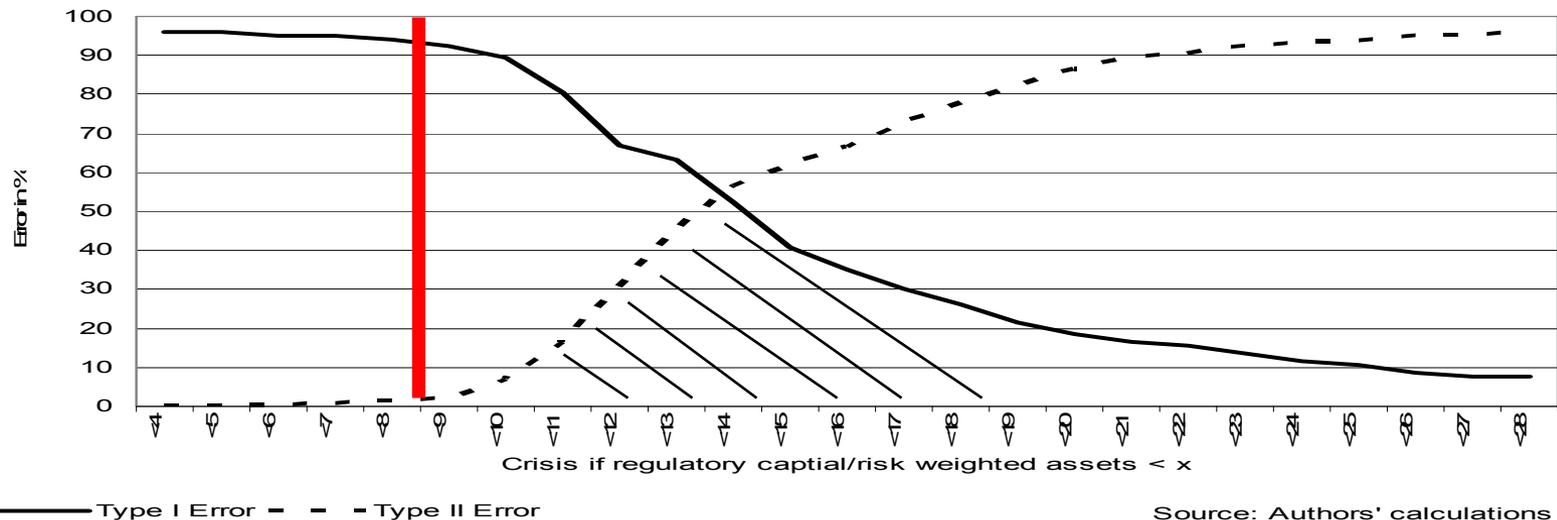
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Nonparametric Tests

To further investigate the results obtained with the parametric models, we use nonparametric tests for selected aggregate bank ratios.

Nonparametric tests do not impose distributional assumptions on the data and the inferences are therefore more robust.

Type I/II Error for Capital to Risk Weighted Assets



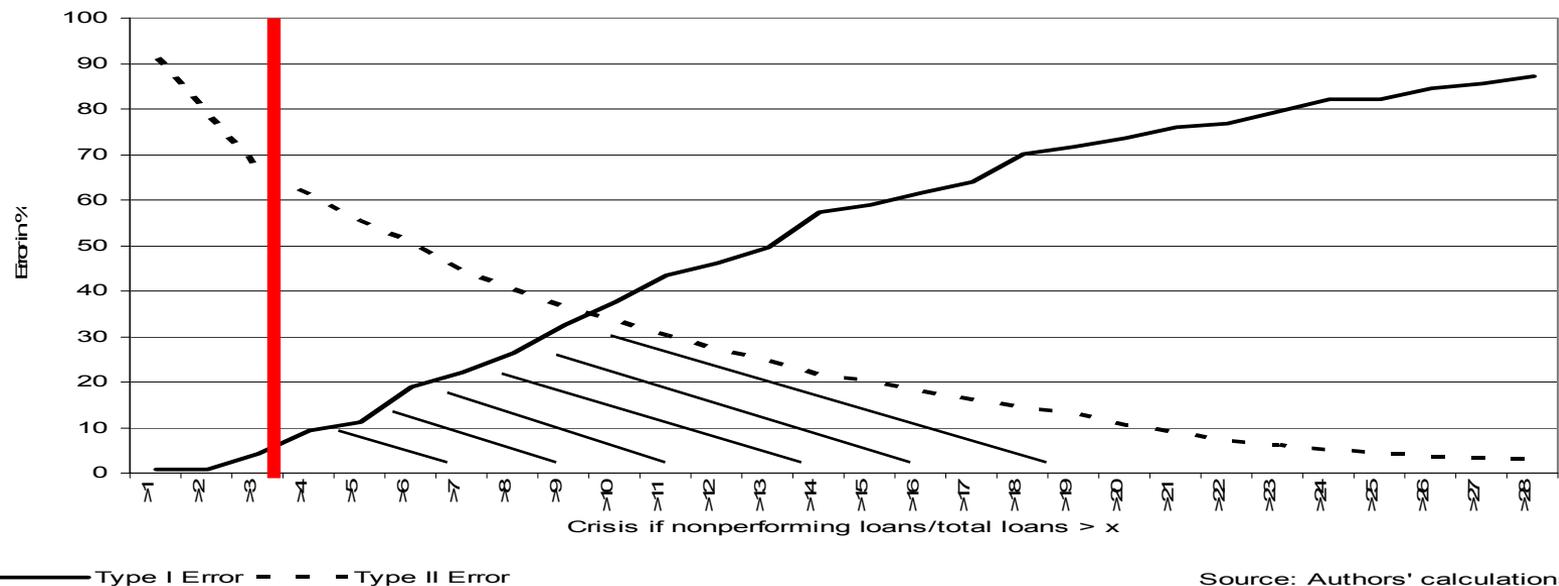
Even at a cutoff level of 8 percent for the ratio of regulatory capital/risk weighted assets, we would miss all crises in our sample (100% Type I Error).



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Nonparametric Tests (cont'd)

Type I/II Error for NPLs to Total Loans



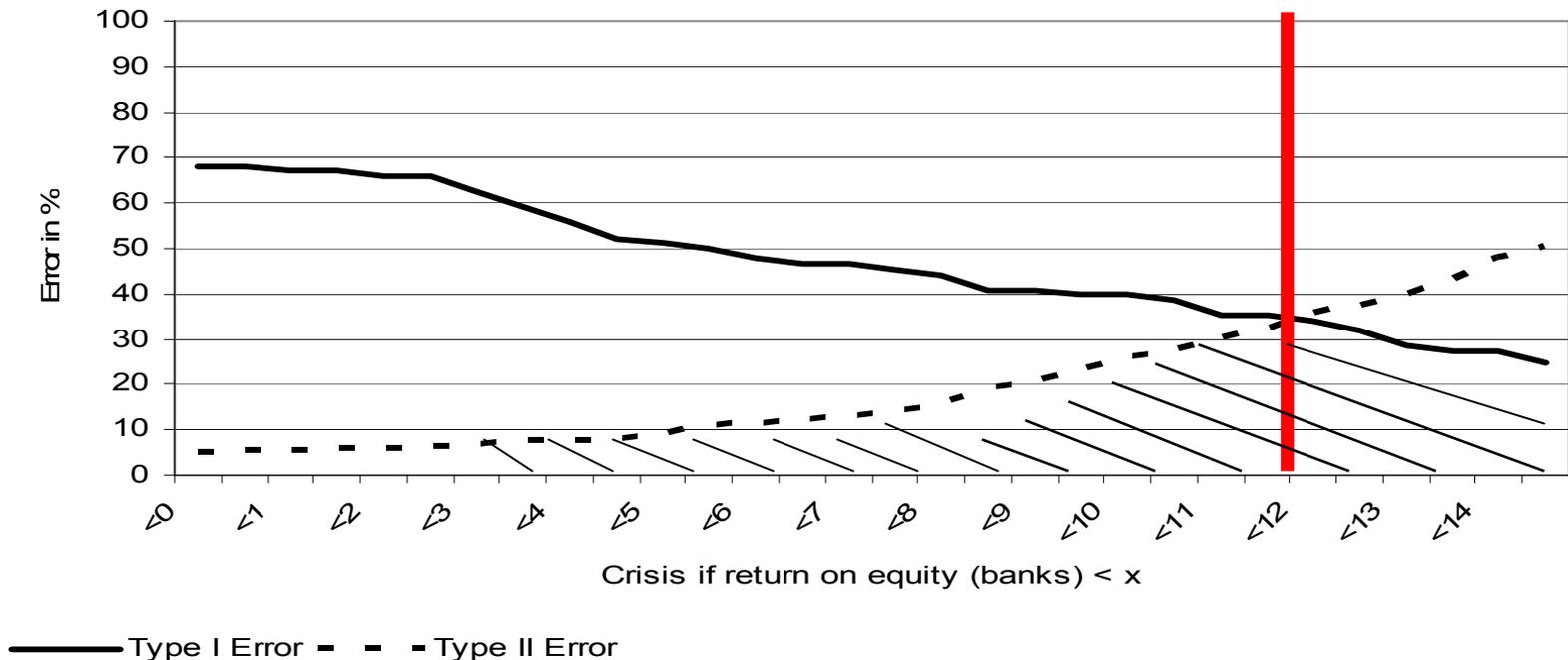
The ratio of NPLs to total loans has some discriminative power. At a low cutoff point of 3 percent, approximately 94 percent of all crises are correctly classified. However, the low cutoff point gives rise to a considerable Type II error of more than 60 percent.



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Nonparametric Tests (cont'd)

Type I/II Error for Return on Equity

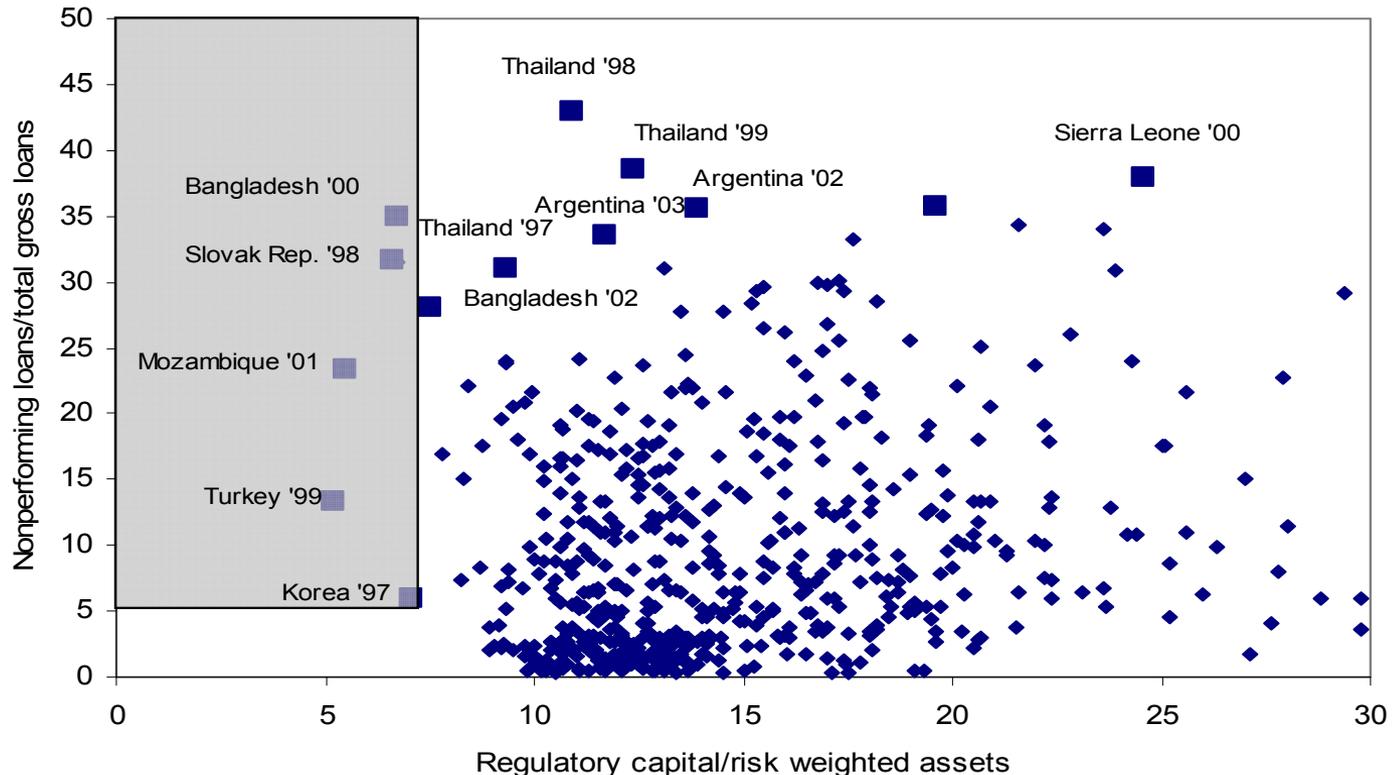


Approximately 64 percent of all crises periods are correctly classified at a cutoff value of 12 percent, whereas the Type II error remains low at 35 percent.



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Nonparametric Tests: NPLs vs. Capital Adequacy



Crisis episodes would be expected to cluster in the northwest region. However, many of the crisis countries are widely dispersed in the diagram. Thus, relying exclusively on these two indicators would lead to misleading inferences.



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Concluding Remarks

Overall, preliminary evidence that FSIs have some benefits for the early warning of banking problems.

This is corroborated by:

- (1) descriptive statistics and plots for crisis/non-crisis cases
- (2) logit and duration regressions
- (3) nonparametric estimates

The estimates are somewhat encouraging, but the aggregate FSIs seem only a very rough tool.

Need to bear in mind that predictive accuracy is a more general weakness of EWS models.



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Caveats and Limitations

Our findings have to be interpreted with caution, because

- (1) dataset covers only a short time horizon
- (2) FSIs are backward looking
- (3) variables may be subject to “regulatory smoothing”

In sum, macroprudential analysts should not solely rely on FSIs. Such indicators ought to be complemented by other indicators, tools, and methods (market-based indicators, stress tests, assessments of standards, etc.)

